CANADIAN COMMITTEE FOR THE INTERNATIONAL BIOLOGICAL PROGRAMME

ORGANIZATION AND ACTIVITIES

1964 - 1970

MAY 1971

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FOREWORD

This brief review was prepared to satisfy requests from several sources for information on the organization, activities and accomplishments of the Canadian Committee for the International Biological Programme (CCIBP). The committee was organized early in the preparatory phase (1964-67) but most of the research plans and proposals were not fully formulated until 1967-68. The operational phase (1967-72) was therefore taken as 1968 to 1972 inclusive.

A full assessment of the Canadian program must await the consolidation and interpretation of the results at the end of the five-year operational phase. The interim observations and highlights reported here were taken from the detailed annual reports and publications available to the end of 1970. This list could be greatly expanded and it may be that the selection has excluded some of the most important findings. All projects were highly commended by the independent review committees appointed to review each project at mid-term. This in itself is a tribute to the guidance given by the specialized subcommittees and project steering committees, but most of all it reflects the work and dedication of the project directors and participants.

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THE INTERNATIONAL BIOLOGICAL PROGRAMME

In 1964, the International Council of Scientific Unions (ICSU) agreed to sponsor an International Biological Programme (IBP) comprising an integrated study of the biological basis of productivity and human adaptability. A Special Committee of ICSU (SCIBP) was appointed to organize and execute the program. The initial plan had two phases:-

Phase I	Planning and Preparation	(1964-1967)
Phase II	Operations	(1967-1972)

At the Fourth General Assembly of SCIBP (Rome, September 1970), it was agreed to extend the program for two years to provide for the synthesis of data and transfer of worthy projects to other organizations. This extension was termed:-

Phase III	Synthesis and Transfer	(1972-74)

The scientific activities of IBP were organized into seven sections each with a convener and committee responsible for the planning, coordination and exchange of information in the following areas:-

PT Productivity Terrestrial
PP Production Processes, comprising Photosynthesis (PP-P) and Nitrogen fixation (PP-N)
CT Conservation Terrestrial
PF Productivity Freshwater
PM Productivity Marine
HA Human Adaptability
UM Use and Management

Within these broad sectional areas there are more specialized groupings termed "themes" each with a theme coordinator and working party. Thus, grasslands, tundra, woodlands etc. are themes of the PT section. By 1970 some 83 themes representing over 2,000 individual research projects were active under the seven sections.

At the national level each participating nation was required to appoint a national committee that would be responsible for organizing and financing its own program. By 1970 some 58 countries had established national committees and 32 others participate informally.

CANADIAN PARTICIPATION

Organization

In 1963, the National Research Council, the Canadian adherent to ICSU, established an ad hoc committee to consider all aspects of Canadian participation in IBP. This committee recommended:-

1. Canadian participation and the formation of a national committee;

2. that government departments and universities be invited to participate;

3. that NRC support the participating universities;

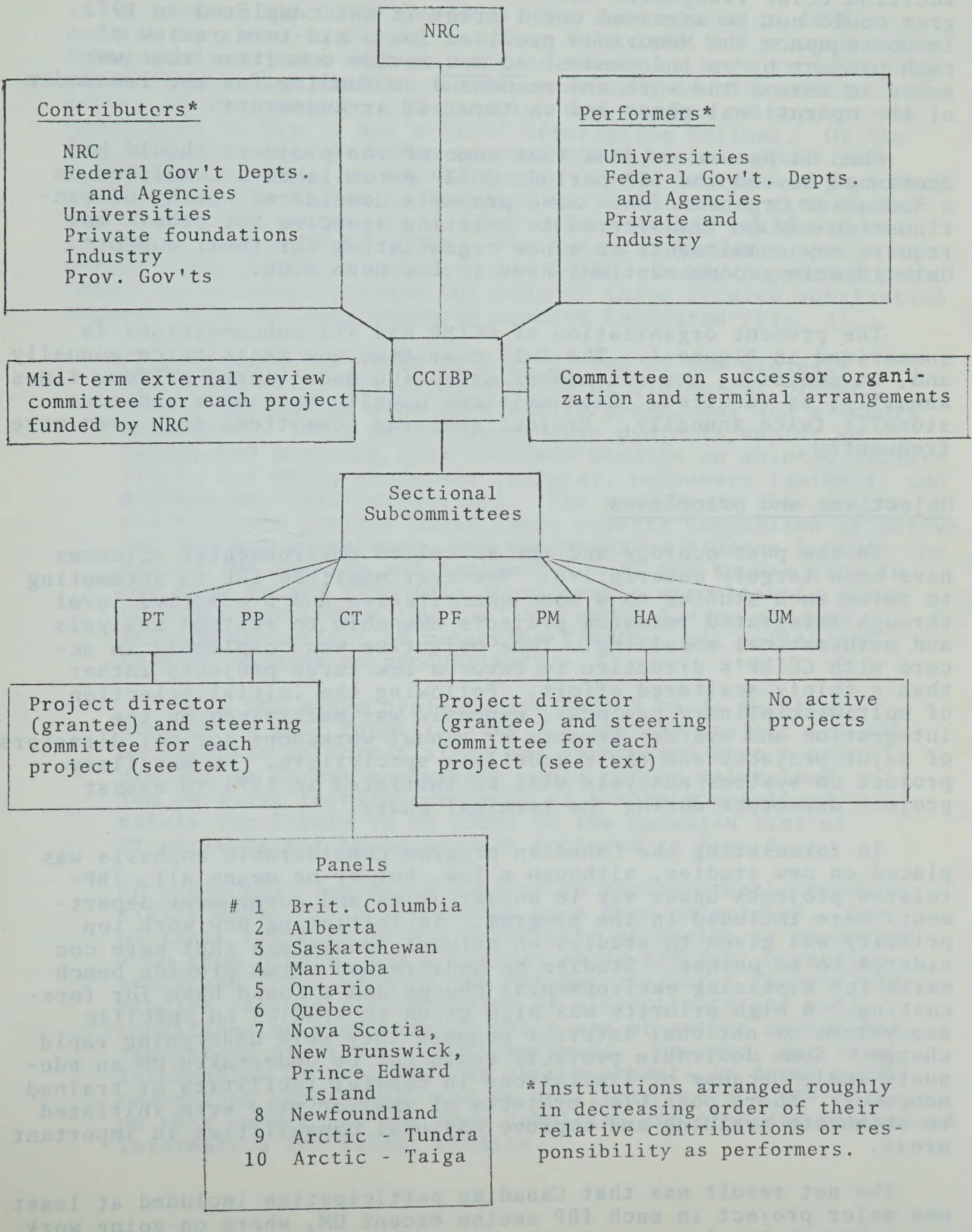
4. that such support favor large integrated research projects within Canadian interests and capabilities rather than a thinly-scattered effort over a wide field.

Following these directives the Canadian Committee for the International Biological Programme (CCIBP) was formed and held its first meeting in January 1965. At this session it established seven specialist subcommittees to match the seven sections established by SCIBP. It was also recognized that special organizational and funding arrangements would be required to mount integrated multidisciplinary projects involving participants from different university departments and universities, and to ensure continuity for a five-year program.

By agreement between the participating institution and CCIBP, all recognized IBP projects supported by NRC were subject to a Memorandum of Understanding that described the nature and objectives of each project, its duration, reporting procedure, project organization, including the name of a project director (grantee), and a steering committee made up of the principal participants. Other clauses dealt with the handling of funds and ownership of equipment. While these Memoranda are not contracts, they have proved to be most helpful in avoiding misunderstandings, ensuring continued support from all parties and maintaining a focus on the original objectives during the three years they have been in operation.

A similar but simpler form was adopted for all recognized IBP projects that were supported entirely by universities and government departments.

FIG. 1. ORGANIZATIONAL CHART
CANADIAN COMMITTEE FOR THE INTERNATIONAL BIOLOGICAL PROGRAMME



These operational groups report to the appropriate subcommittee on all aspects of their activities and requirements. In addition CCIBP recognized that the real achievements of the program could not be assessed until after it was completed in 1972. In consequence the Memoranda provided for a mid-term review of each project by an independent ad hoc review committee that was asked to assess the work and recommend on funding for the remainder of the operational phase and on terminal arrangements.

When it became evident that some of the projects should be continued beyond the IBP period, CCIBP established a Committee on a Successor Organization. Some projects considered worthy of continuation may be transferred to existing agencies but others may require new commitments or a new organization for their support. Only interim recommendations have so far been made.

The present organization of CCIBP and its subcommittees is summarized in Figure 1. The full committee now meets twice annually and, in addition, its six-member executive meets three or four times annually, as required. Subcommittees usually meet once and occasionally twice annually. Project steering committees meet even more frequently.

Objectives and priorities

In the past ecology and the so-called environmental sciences have been largely descriptive. Wherever possible IBP is attempting to raise such studies to a more quantitative and predictive level through integrated research projects amenable to systems analysis and mathematical modelling. This objective was completely in accord with CCIBP's directive to favor a few large projects rather than a thinly-scattered effort. Following the initial selection of multidisciplinary projects, emphasis was maintained on the integration and systems aspects by annual workshops for all directors of major projects and their modelling specialists. An ancillary project on systems analysis will be initiated in 1971 to assist project directors during the terminal phase.

In formulating the Canadian program considerable emphasis was placed on new studies, although a few, but by no means all, IBP-related projects under way in universities and government departments were included in the program. In initiating new work top priority was given to studies on natural ecosystems that were considered to be unique. Studies on undisturbed sites provide bench marks for assessing environmental change and a sound base for forecasting. A high priority was also given to studies on specific ecosystems of national interest because they were undergoing rapid change. Some desirable projects could not be undertaken on an adequate scale because of limitations in capital facilities or trained manpower. Where possible, projects of smaller size were initiated to stimulate training and improve national capabilities in important areas.

The net result was that Canadian participation included at least one major project in each IBP secion except UM, where on-going work was a departmental responsibility.

Description of projects

A list of all CCIBP projects that were active in 1970 or earlier is given in Figure 2. They fall into two groups: major integrated projects with as many as twenty or more professional participants; and smaller ancillary or individual projects. The nature of the project, its location and sources of support are summarized in Fig. 2 and a brief description follows. Of the twelve major projects seven receive their basic support from CCIBP (NRC funds) or by NRC directly. Three others are performed entirely by the Fisheries Research Board of Canada with their own staff, and another is a joint effort by FRB staff and universities supported by CCIBP. The National Museum supports a marine identification centre. All CCIBP- or NRC-supported projects are university-based but some of these receive substantial support from the supplementary sources indicated (Fig. 2).

PT projects: As shown in Fig. 2, two of the projects (PT-2 and PT-5) are major studies of biological productivity and energy flow in a native grassland, and a tundra ecosystem. These multidisciplinary projects employ an integrated approach that includes studies on abiotic factors (soil, air etc), producers (plants), consumers (animals) and decomposers (microorganisms). The grasslands site in the heart of the prairie wheat lands permits comparison of native and managed ecosystems, and manipulation studies include the effects of burning and irrigation. At the tundra site in the high Arctic (75°-40') considerable attention is given to large herbivores (muskox) and manipulation studies include the effect of vehicular traffic, oil spills and related hazards on productivity.

Both the above projects are served by an ancillary project on soil fungi (PT-4A). A similar project (PT-4B) on bacteria in forest sites was terminated when a major project on forest ecosystems could not be maintained. Two on-going forestry projects of a more specialized nature are likely to be added to the Canadian list of PT projects but these are not included in Fig. 2.

PP projects: Two major studies on photosynthetic productivity under field conditions have been undertaken. One of these (PP-P/2) at the University of Guelph is concerned with crop plants, and a similar study (PP-P/3) on native grassland forms part of the Matador project. These field studies include the variables of microclimate and soil conditions on productivity which are absent in controlled laboratory studies on photosynthesis. However, far less information is available on photosynthesis in trees under controlled conditions, and an ancillary project (PP-P/1) on this aspect has now been completed and provides background information for forest studies.

ABBREVIATIONS, FIGS. 1 and 2

CCIBP - Canadian Committee for the International Biological Programme

IBP Sections

PT - Productivity Terrestrial
PP - Production Processes
  PP-P (Photosynthesis)
  PP-N (Nitrogen fixation)
PF - Productivity Freshwater
PM - Productivity Marine
HA - Human Adaptability
CT - Conservation Terrestrial
UM - Use and Management

Federal Government Departments and Agencies

EMR - Energy Mines and Resources
FF - Fisheries and Forestry
FRB - Fisheries Research Board
IAND - Indian Affairs & Northern Development
MOT - Transport
NH&W - National Health and Welfare
NMC - National Museums of Canada
NRC - National Research Council of Canada

Agencies and Foundations

AINA - Arctic Institute of North America
CanC - Canada Council

Other

COIC - Canadian Oceanographic Identification Centre
NWT - Northwest Territories

Fig. 2. PROJECTS, THEIR LOCATION AND SOURCE OF SUPPORT

IBP Section & CCIBP No.	Location of Major Multi-disciplinary Projects	Supporting Organizations Primary	Supplementary	
PT-2,PP-P/3) PP-N/2)	Matador, Saskatchewan	CCIBP*	1,4	
PT-5	Tundra, Devon Island, NWT	NRC	1,2,3,4	
PP-P/2	Guelph, Ontario	CCIBP	4,5	
PF-1	Marion Lake, British Columbia	CCIBP	1,4	
PF-2	Char Lake, Resolute, NWT	CCIBP	1,2,4	
PM-1	Strait of Georgia, Pacific	FRB		
PM-3	Gulf of St. Lawrence	CCIBP & FRB	1,4	
PM-5	COIC,Nat.Museum of Natural Science	NMC		
PM-6	St. Margaret's Bay, N.S. Atlantic	FRB		
PM-7	Frobisher Bay, NWT	FRB		
HA-1	Eskimos, Igloolik, NWT	CCIBP	1,4	
CT 8-1 to-10	Nation-wide, ten regional panels	CCIBP	1,4,5	
	Ancillary and individual projects			
PT-4(A)	Soil fungi, Univ. of Calgary	CCIBP	1,4	
PT-4(B)	Soil bacteria, Univ. of Guelph	CCIBP	1,4	T.1970
PP-P/1	Tree photosynthesis, Queen's Univ.	FF,CCIBP	4	T.1970
PP-N/1	N-fixation, Univ. of Manitoba	CCIBP	4	T.1971
PP-N/3	N-fixation, Macdonald College	CCIBP	4	
HA-3	French communities, Univ. Montreal	2,5	4	
HA-5	Child development, Univ. Montreal	1,2	4	
HA-6	Child fitness, Univ. Saskatchewan	1,2	4	
CT	Environmental law, Univ.Brit.Col.	CanC	CCIBP	

*CCIBP funds come entirely from NRC.

[1]Gov't. depts. and agencies, principally FF, FRB, IAND, EMR, NH&W, and MOT.

[2]Foundations etc., Canada Council, Donner Foundation, AINA etc.

[3]Industry, oil companies (Imperial, Gulf, Shell, Elf, King Resources etc.).

[4]University participating in project.

[5]Provincial Government departments.

[T]Indicates year of termination

Nitrogen-fixation is being investigated at Matador (PP-N/2) and in two ancillary projects at the University of Manitoba (PP-N/1) and Macdonald College (PP-N/3). These have been concerned largely with non-symbiotic organisms. While none of these projects is large in scale, they should provide comparative information on nitrogen-fixation in grassland, agricultural and forest soils.

PF projects: Two integrated studies on biological productivity and energy flow were undertaken; one at Marion Lake, British Columbia (PF-1), and one at Char Lake, Resolute, NWT (PF-2) in the Arctic. These relatively small lakes were chosen to facilitate the collection of the fullest possible information but neither has proved to be a simple ecosystem. Several types of models have been developed for productivity in Marion Lake and these are being tested and refined. In spite of the lower productivity of Char Lake, this ecosystem is also complex. Some aspects of this study on a natural Arctic lake (Char) have been extended to include a polluted (Meretta) and an enriched (Resolute) lake in the same area.

The IBP/PF section recently requested Dr. K. H. Mann at Dalhousie University and CCIBP to undertake the analysis of the results to date of world IBP/PF research. This project will be jointly supported by IBP/PF and CCIBP. As it will not be active until late 1971, it is not listed in Fig. 2.

PM projects: Three major projects (PM-1, PM-6 and PM-7) had been initiated by the Fisheries Research Board (FRB) before or about the time IBP was organized, and were included in the Canadian program. These studies provide information on productivity in certain regions of the Atlantic, Arctic and Pacific Oceans.

Over half the Canadian population resides within the drainage basin of the St. Lawrence and the Gulf is now undergoing rapid change as indicated by an average rise of water temperature of 0.5 to 1.5°C during recent years. A major project on seasonal cycles in primary production in the Gulf was initiated by CCIBP (PM-3A) to supplement studies on physical oceanography (PM-3B) and invertebrate and fish production (PM-3C) initiated and supported by FRB.

To provide these marine projects with adequate facilities for identifying organisms, CCIBP requested the cooperation of the National Museums of Canada. As a result they established the Canadian Oceanographic Identification Centre (COIC) at their own expense and these services are recognized as PM-5.

HA projects: As part of the international study on the circumpolar peoples, a major project (HA-1) was undertaken on the Eskimo population at Igloolik and Hall Beach, NWT. This is an extensive multidisciplinary study including observations ranging from genetics and physiology to the fitness and aptitudes of a native population that is now undergoing rapid cultural change.

Three smaller projects, supported by grants from government departments, foundations and the universities involved, are included in this section. These are: a study of isolated French communities (HA-3), child development (HA-5) and child fitness (HA-6), and another dealing largely with the native Indian population is likely to be added to this list but does not appear in Fig. 2. These ancillary studies will provide a basis for broad comparisons when the investigations are complete.

CT projects: Consideration of the more urgent national needs resulted in Canada's undertaking CT activities with two objectives: (1) to check sheet unique natural ecosystems and (2) to encourage competent authority to protect unique sites that had no preservation status. The geographic size of Canada makes the first objective an enormous task, while the second objective is complicated by having eleven separate political jurisdictions in control of crown lands.

The work was undertaken by defining ten regions based largely on provincial boundaries, each served by a panel of experts appointed to accomplish both objectives in their own region. The chairmen of these panels constitute the CT Subcommittee and the entire national undertaking is regarded as one project.

At an early stage it became evident that legislation for protecting these ecological reserves was non-existent or inadequate in certain jurisdictions. An auxillary project, funded by the Canada Council, was undertaken to review existing legislation in this and other lands, to assess its adequacy, and, in consultation with the CT panels, to recommend on the essential requirements of any new legislation that may be enacted.

Interim assessment

How far the program will succeed in its main objective of forecasting ecological change cannot be fully assessed until all the results are available for integration and modelling following completion of the five-year operational phase. An interim assessment based on several lines of evidence suggests that Canadian participation in IBP has been impressive.

At the international level Canadian scientists have recently been appointed or elected: as conveners of two of the seven sections of SCIBP; as coordinators of four of the specialized themes; and as authors or co-authors, have written three of the fourteen IBP Handbooks. Other Canadians have also convened a number of *ad hoc* international meetings and workshops.

At the national level all projects have been reviewed and highly commended by independent review committees having one or more international members. Several projects were termed "centres of excellence" and others recommended for extension or continuation beyond IBP. Under present financial constraints the recommendations of these committees have been most useful in establishing priorities for the remainder of IBP.

Over 100 scientific papers have been published on specialized aspects of the Canadian program. These present only a partial picture of the extensive data and results available in the detailed annual reports. Some general observations and highlights are summarized below:

Some interim observations and highlights

1. Primary biological productivity on the grasslands site at Matador is about $335g/m^2/y$ above ground and root production is estimated to be equivalent. Total production is therefore about $670g/m^2/y$ but varies by a factor of two from year to year.

2. The commonly accepted concept of grasslands productivity in temperate climates is that grass shoots develop at the beginning of the growing season, reach a maximum in midsummer, and then die. Observations at Matador indicate that growth and death take place throughout the growing season. The net result is that primary productivity is substantially higher than estimates based on annual harvests. Management practices that utilize the observed growth pattern could potentially increase secondary production of grazing animals.

3. On Devon Island in the high Arctic (75°-40'), temperature maxima and much of the biological activity, such as plant growth, flowering and bird nesting, are closely linked to the solar high (21 June). Productivity varies greatly over short distances; a greater number of species, and individuals within species, of bacteria, fungi and invertebrates are present in the wet soils of sedge meadows than in the drier gravelly soils of raised beach ridges. The differences between sites separated by only 300 feet laterally or 4 feet vertically are greater than those that occur in grassland and alpine soils in western Canada.

4. Preliminary observations at Devon Island indicate that the density and biomass of rodents (lemming) and large herbivores (muskox) are not vastly different from that of a western grassland with its rodents and pronghorn or cattle.

PP 5. At Matador there are 50 to 75 g dry wt/m^2 (to a depth of 30 cm.) of soil bacteria and about twice this amount of soil fungi. In the virgin grassland soils at Matador it was thought that protein production might depend to a large extent on the throughout the season is about 0.7 kg/ha/year. Rainfall contributes 2-3 kg nitrogen/ha/year. Rainfall is, therefore, of equal or even greater importance than biological fixation in the nitrogen cycling of these soils.

6. Anaerobic species of bacteria are primarily responsible for non-symbiotic nitrogen fixation in both virgin grassland, pasture and woodland soils. Fixation is greatest at moderate temperatures in soils with a high moisture content. In most soils it is also limited by available carbon sources. Mats of blue-green algae at the soil surface and root nodules containing symbionts on both leguminous and non-leguminous species may also be responsible for significant amounts of nitrogen fixation.

7. In controlled environment growth chambers, CO_2 exchange measurements have been developed that correlate well with dry matter production in populations, individuals, and parts of young poplar trees. This provides a valuable guide for measuring production dynamics in the forest and an important new approach for assessing effects of pollutants.

8. Photosynthetic productivity under field conditions depends on the immediate physical environment of the leaves (micrometeorology) which varies in space and time. An over-all balance between dry matter production, radiation and CO_2 exchange has been obtained but the model is complex. Physical factors such as radiation, temperature, relative humidity, CO_2 content and wind velocity interact

to affect such biological factors as stomatal opening, evapotranspiration and respiration. These, in turn, produce resistances to gas exchange and differences in net assimilation of CO_2 which greatly affect photosynthetic productivity.

9. In the field the maximum efficiency of carbon fixation by mature leaves subtending a rapidly filling ear of corn was 5.9% of the energy of visible light. The efficiency of converting visible light to starch in the grain was 1.1% of the incident energy during the growing season (May 1 to September 30).

PF 10. The difference in primary productivity of temperate and Arctic lakes appears to be much greater than the difference between marine environments in comparable latitudes. At Char Lake, Resolute, NWT, annual production is about a tenth of that in Marion Lake, Haney, British Columbia. The low primary productivity of Char Lake is attributed to lack of nutrients as light limitations are not important except in winter.

11. Comparative studies in three nearby lakes that can be described as natural (Char), enriched (Resolute), and polluted (Meretta) have provided information on the susceptibility of Arctic lakes to human pollution. The results indicate the possibility of using winter respiration on Arctic lakes to predict their productivity and detect any serious change in their condition.

PM 12. Primary marine productivity in the plankton in an Arctic inlet, Frobisher, NWT, is less than half that in St. Margaret's Bay, Nova Scotia, and more variable from year to year, apparently because of the variable duration of the snow-covered sea ice which inhibits light penetration. In St. Margaret's Bay the contribution to primary production by the seaweeds is greater than that of the plankton, and occurs mainly in late winter and early spring.

13. In St. Margaret's Bay, Nova Scotia, and probably along most of the rocky shores of Eastern Canada, the productivity of seaweeds is much greater than had been realized. In one location the kelps produced annually about $6^1/_2$ tons for every metre of shore line. This is a major contribution to the productivity of coastal waters. The kelps grow well in low temperatures and at low light intensities and are probably major contributors to the productivity of Arctic waters.

14. In an intensive study of the processes operating in a polluted marine basin, it was shown that, although the concentrations of nutrients are much higher than in a nearby unpolluted basin, and there is a greater density of phytoplankton, the annual phytoplankton primary production is only about 15% higher. Of the new material produced during one day, about one-third is consumed by resident zooplankton while two-thirds is flushed out to sea, mainly by tidal action.

15. Total primary biological productivity in St. Margaret's Bay, Nova Scotia, and Departure Bay, British Columbia, are similar and approximate $200 gC/m^2/y$.

16. Terrigenous organic material entering the Strait of Georgia from rivers is approximately equal in amount to the marine primary production of the area but it is only about one-third as effective in supporting animal growth. Biological baselines and other factors indicate that, beyond local effect, the Strait is not polluted.

17. Results from a 9-parameter model simulating plankton populations suggest that steady state mean ecological efficiencies cluster closely about a value of 12% and vary appreciably only with plant growth rate, zooplankton respiration and zooplankton mortality.

18. In the Gulf of St. Lawrence primary production increases from east to west by a factor of four or five and is correlated with the concentration of nutrients. A continuous supply of nutrients to the surface water is provided by upwelling in the St. Lawrence Estuary, generating the highest rates of primary production in the Gaspé current system. Primary production declines to the east and south across the Magdalen Shallows as nutrients are exhausted, but it seems likely that secondary production is greatest in this area, which is an important nursery for commercial fish stocks. Construction of a tentative model of the main primary and secondary production system should soon be possible.

19. Large blue-fin tuna have become increasingly abundant in the more northern parts of its range including the Gulf of St. Lawrence. This is attributed to warmer surface water temperatures (0.5 to 1.5°C above average), particularly during the summer season. Herring evidently move out of the Gulf in winter but return in spring.

CT 20. Biological inventories of unique natural sites have been made throughout the nation by ten panels of experts. Over 200 such sites have been recommended to federal and provincial authorities for preservation as ecological reserves for future research. The British Columbia Government has enacted legislation to protect over 100 ecological reserves in that province. Other governments have also taken action to protect some unique sites within their jurisdiction.

21. Protection of the natural areas as ecological reserves requires the formulation of adequate legislative and administrative measures. Existing legislation in Canada and abroad has been reviewed, assessed and extended to indicate what action should be taken to preserve these natural areas. These requirements form the bases of the Ecological Reserves Act enacted in British Columbia in 1971.

HA 22. A longitudinal study of Saskatchewan children from ages 7 to 13 indicates their physical efficiency is a constant function of age. They are of average physical fitness and taller and heavier than Saskatchewan children of similar age in 1936, 1946 and 1956, confirming the continuance of the secular trend towards increasing height and weight in children. Longitudinal growth curves in strength show a relation to physical activity pattern.

23. Studies on growth and development in French-Canadian children in Montreal, and related studies on isolated French communities in Canada and other parts of the world provide a broad basis for comparison when the work is complete.

24. Human adaptability studies on the Eskimos at Igloolik have shown that they are in generally good health but are showing the effect of the current transition from native to western food, e.g., a rapid population growth and more rapid tooth deterioration, the latter attributed to the introduction of soft drinks and candy.

25. A number of the Eskimos, including hunters, have defects in vision requiring corrective lenses. Glasses had to be prescribed for hunters. Even the relative sedentary members of the Eskimo population have a degree of physical fitness corresponding to that of a fit young white man, but their movement patterns were more clumsy.

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HA-3 Drs. J. Benoist, J. Gomila, J. Dubreuil
Faculty of Social Science
University of Montreal
Montreal, Que.

HA-5 Dr. A. Demirjian
Faculty of Dental Surgery
University of Montreal
Montreal, Que.

HA-6 Dr. D. A. Bailey
School of Physical Education
University of Saskatchewan
Saskatoon, Sask.

CT project, Conservation of ecosystems, Co-Chairmen of ten regions:

Region 1 -	British Columbia,	Drs. V.J. Krajina and P.A. Larkin, Univ. British Columbia
" 2 -	Alberta,	Drs. G.H. LaRoi and W.A. Fuller, Univ. Alberta
" 3 -	Saskatchewan,	Drs. J.S. Rowe and U.T. Hammer, Univ. Saskatchewan
" 4 -	Manitoba	Drs. J.M. Walker-Shay and R.W. Nero, Univ. Manitoba
" 5 -	Ontario	Mr. G. A. Hills and Dr. J.B. Falls, Univ. Toronto
" 6 -	Quebec	Drs. M. Maldague, G. Lemieux, and G. Moisan, Univ. Laval
" 7 -	Nova Scotia New Brunswick Prince Edward Island	Dr. Ian MacQuarrie Univ. Prince Edward Island
" 8	Newfoundland	Drs.D.H. Steele, Memorial Univ. and E. Rouleau, Univ. Montreal
" 9	Arctic - Tundra	Drs. J. Lambert, Carleton Univ. and A.H. Macpherson, Canadian Wildlife Service, Edmonton
" 10	Arctic - Taiga	Drs. V. Geist, Univ. Calgary and G. Scotter, Canadian Wildlife Service, Edmonton

The following projects will report to IBP in 1971:

PT-6 An integrated research program in ecosystem productivity of the boreal fir-forest (Montmorency Project).
Professor Bernard Bernier, Dept. of Ecology and Pedology, Université Laval - Project Director

PT-7 Productivity and nutrient cycling by site in spruce forest ecosystems, Sault Ste. Marie, Ont.
Dr. Alan G. Gordon, Forest Biology Laboratory, Ontario Dept. of Lands and Forests, Sault Ste. Marie - Project Director

HA-7 Les implications anthropobiologiques des changements socioculturels chez les Esquimaux du Nord québecois; leur adaptation biologique.
Professeur Frank Auger, Département d'Anthropologie, Université de Montréal - Project Director